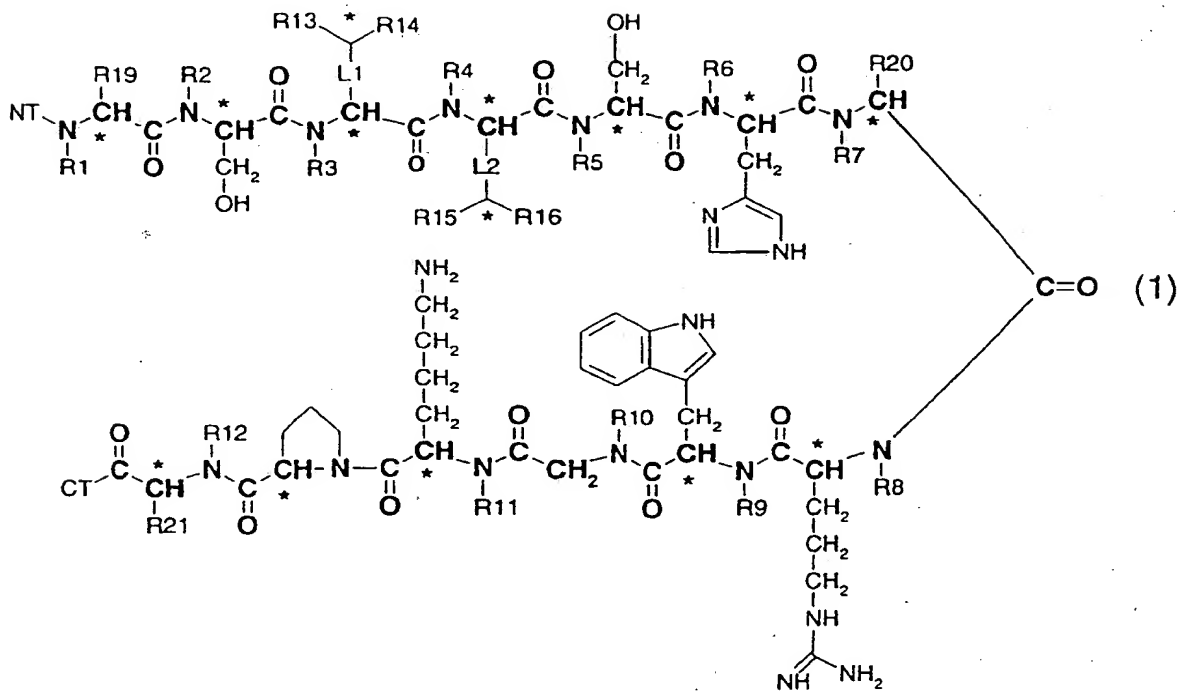
CLAIMS

1. A compound of general formula (1):



(1)

wherein R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11 and R12 are selected independently from each other from H and methyl, with H being preferred,

and wherein R13, R14, R15 and R16 are selected independently from each other from H and alkyl, in particular alkyl selected from methyl, ethyl, propyl, isopropyl, and wherein optionally one hydrogen in R13 and one hydrogen in R14 is exchanged for a bond between R13 and R14, and wherein optionally one hydrogen in R15 and one hydrogen in R16 is exchanged for a bond between R15 and R16, and wherein L1 and L2 are linkers which are independently selected from the group consisting of single bond, methyl, ethyl, with single bond being preferred,

and wherein R19, R20 and R21 are selected independently from each other from H and

$-CH_2X$, where X is H, alkyl, substituted alkyl, heteroalkyl, substituted heteroalkyl, alkenyl, substituted alkenyl, heteroalkenyl, substituted heteroalkenyl, alkynyl, substituted alkynyl, heteroalkynyl, substituted heteroalkynyl, cycloalkyl, substituted cycloalkyl, cycloheteroalkyl, substituted cycloheteroalkyl, cycloalkenyl, substituted cycloalkenyl, cycloheteroalkenyl, substituted cycloheteroalkenyl, aryl, substituted aryl, heteroaryl, substituted heteroaryl, functional group,

and wherein NT is selected from H, hydroxyl, alkyl, aminoacid, aminoacid analogue, polypeptide and functional group, and CT is selected from hydrogen, hydroxyl, alkyl, aminoacid, aminoacid analogue, polypeptide and functional group, and wherein each asymmetric center (*) is in R or S configuration;

the compound optionally possessing one or several of the following properties:

a) showing high affinity for MC1 receptors, and/or

b) showing high selectivity for MC1 receptors, and/or

c) showing high capacity to stimulate the second messenger cAMP, and/or,

d) being an effective inhibitor of NO production.

2. The compound of claim 1, wherein R20 is $-CH_2X$, wherein X is phenyl.

3. The compound of claim 1 or 2, wherein one or several of the nitrogens of the peptide backbone have been exchanged for carbon substituted with hydrogen, and/or wherein one or several of the oxygens of the carbonyl groups of the peptide backbone has been exchanged for two hydrogens.

4. The compound of any one of claims 1 to 3, having the stereomeric conformation given in the general formula (2):

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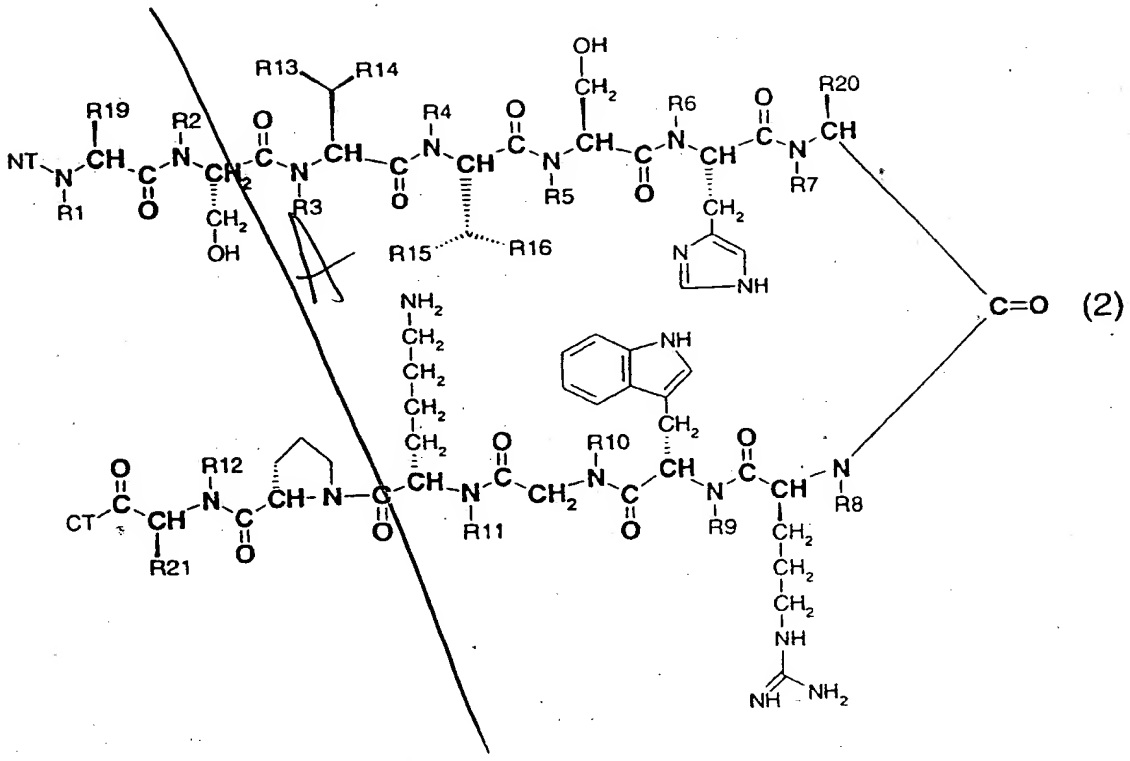
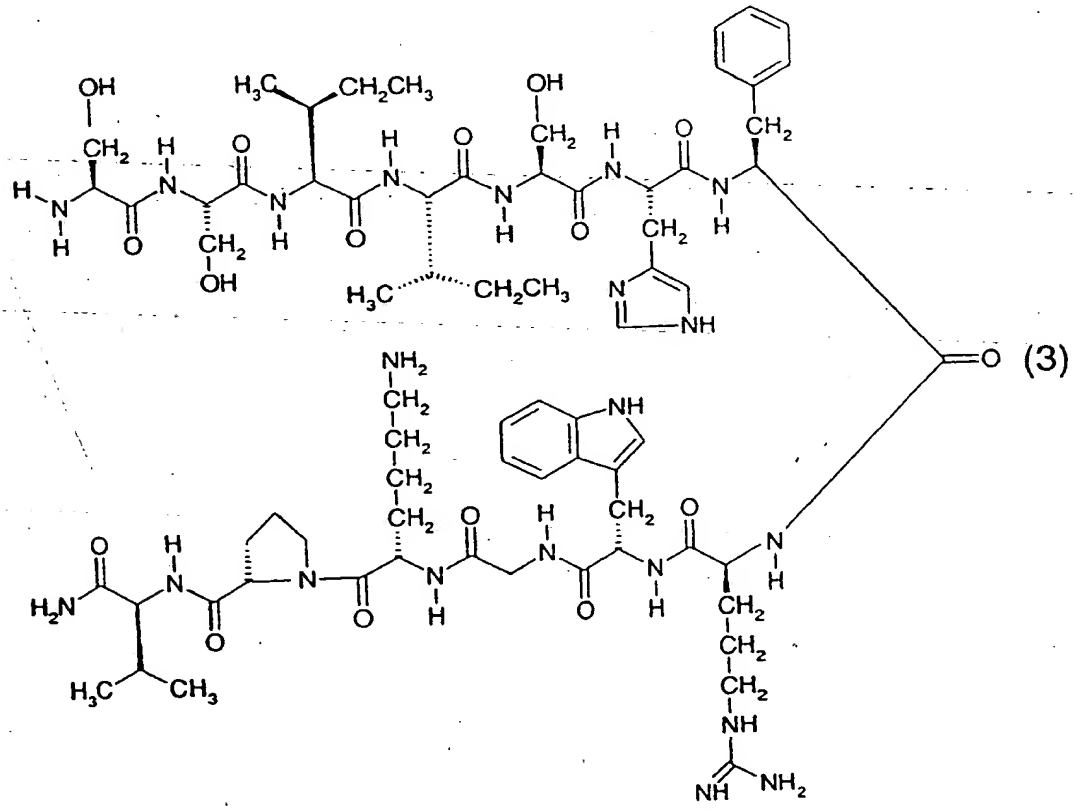


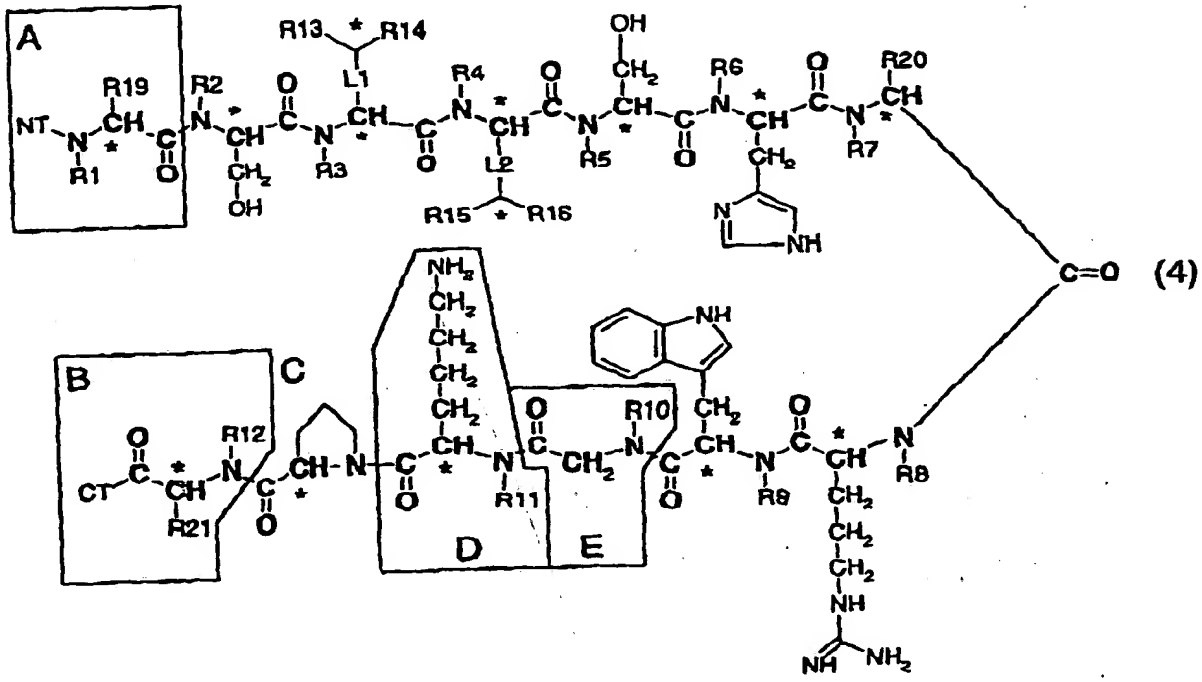
(2)

5. A compound according to claim 1, of formula (3) (SEQ ID NO:1):



(3)

6. A compound of the general formula (4):



(4)

wherein R1 to R16, R19 to R21, NT and CT are as defined in claim 1,

wherein moiety A is optionally exchanged for hydrogen, hydroxyl, alkyl, aminoacid, aminoacid analogue, polypeptide, or functional group,

wherein moiety B is optionally exchanged for hydrogen, hydroxyl, alkyl, aminoacid, aminoacid analogue, polypeptide, or functional group,

wherein optionally moiety D is exchanged for aminoacid or aminoacid analogue,

and wherein optionally moiety E is exchanged for aminoacid or aminoacid analogue.

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7. A compound according to any one of claims 1-4 or 6, wherein one or several of R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11 and R12 are selected to be methyl, whereas the rest is selected to be hydrogen, the selections being made so as to prevent or decelerate breakdown by proteases and/or peptidases.

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8. A compound according to any one of claims 1-4 or 6, wherein less than 6, preferably less than 5, more preferred less than 4 and preferably less than 2, and most preferred none of the R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11 and R12 are methyl.

9. A compound comprising the sequence Ser-Ser-Ile-Ile-Ser-His-Phe-Arg-Trp-Gly-Lys-Pro-Val-NH_2 (SEQ ID NO:1), wherein the amino-acids are all L-amino-acids.

10. A compound comprising one of the followings sequences:

Ser-Ser-Ile-Ile-Ser-His-dPhe-Arg-Trp-Gly-Lys-Pro-Val-NH_2 (MS-09) (SEQ ID NO:2)
Tyr-Ser-Ser-Ile-Ile-Ser-His-Phe-Arg-Trp-Gly-Lys-Pro-Val-NH_2 (MS-30) (SEQ ID NO:3)
Tyr-Ser-Ile-Ile-Ser-His-Phe-Arg-Trp-Gly-Lys-Pro-Val-NH_2 (MS-31) (SEQ ID NO:4)
Ser-Ser-Ile-Ile-Ser-His-Phe-Arg-Trp-Gly-Lys-Pro-Val-Tyr-NH_2 (MS-32) (SEQ ID NO:5)
Ser-Ile-Ile-Ser-His-Phe-Arg-Trp-Gly-Lys-Pro-Val-NH_2 (MS-33) (SEQ ID NO:6)
Thr-Ser-Ile-Ile-Ser-His-Phe-Arg-Trp-Gly-Lys-Pro-Val-NH_2 (MS-34) (SEQ ID NO:7)
Ser-Thr-Ile-Ile-Ser-His-Phe-Arg-Trp-Gly-Lys-Pro-Val-NH_2 (MS-35) (SEQ ID NO:8)
Ser-Ser-Val-Ile-Ser-His-Phe-Arg-Trp-Gly-Lys-Pro-Val-NH_2 (MS-36) (SEQ ID NO:9)
Ser-Ser-Ile-Val-Ser-His-Phe-Arg-Trp-Gly-Lys-Pro-Val-NH_2 (MS-37) (SEQ ID NO:10)
Ac-Ser-Ser-Ile-Ile-Ser-His-Phe-Arg-Trp-Gly-Lys-Pro-Val-NH_2 (MS-38) (SEQ ID NO:11)
dSer-Ser-Ile-Ile-Ser-His-Phe-Arg-Trp-Gly-Lys-Pro-Val-NH_2 (MS-39) (SEQ ID NO:12)
NMeSer-Ser-Ile-Ile-Ser-His-Phe-Arg-Trp-Gly-Lys-Pro-Val-NH_2 (MS-40) (SEQ ID NO:13)
Ser-Ser-Ile-Ile-Ser-His-Phe-Arg-Trp-Gly-Lys-Pro-NMeVal-NH_2 (MS-41) (SEQ ID NO:14)
Ser-Ser-Ile-Ile-Ser-His-NMedPhe-Arg-Trp-Gly-Lys-Pro-Val-NH_2 (MS-42) (SEQ ID NO:15)

11. A compound according to any one of claims 1-4 or 6-8, in which R20 is -CH_2X, wherein X is aryl, substituted aryl, heteroaryl, substituted heteroaryl, phenyl or substituted phenyl, or a compound according to any one of claims 5, 9 or 10, wherein the compound is capable of activating MC1-receptors.

12. A compound according to any one of claims 1-4 or 6-8, in which R20 is -CH_2X, wherein X is aryl, substituted aryl, heteroaryl, substituted heteroaryl, naphthalene, or substituted naphthalene, or a compound according to any one of claims 5, 9 or 10, wherein the compound is capable of blocking MC1-receptors.

13. A compound according to any one of claims 1-12 which inhibits NO (nitric oxide) production, or the formation of nitrite.

14. A compound according to any one of claims 1-12 which is immunomodulatory.

15. A compound according to any one of claims 1-12 which ameliorates, prevents or inhibits contact hypersensitivity.

16. A compound according to any one of claims 1-12 which inhibits sensitization by a hapten, a preferred hapten being 2,4-dinitrofluorobenzene (DNFB).

17. A compound according to any one of claims 1-12 which has an effect on induction of hapten tolerance, a preferred hapten being 2,4-dinitrofluorobenzene (DNFB).

18. A compound according to any one of claims 1-12 which ameliorates, prevents or inhibits formation of oederna, in particular oedema associated with allergic reactions or inflammation.

19. A compound according to any one of claims 1-12 which ameliorates, prevents or inhibits inflammation of blood vesseles or vasculitis.

20. A compound according to any one of claims 1-12 which normalizes blood cell counts, said blood cell counts prior to administration of the compound deviating from the normal.

21. A compound according to any one of claims 1-20, wherein the compound is capable of decreasing the formation of interleukin 1 (IL-1), interleukin 6 (IL-6), and/or tumour necrosis factor α (TNF- α), to afford decreased production of nitric oxide and/or to downregulate the activity of nitric oxide synthase (NOS).

22. A compound according to any one of claims 1-21, wherein the compound is capable of stimulating the production of interleukin 8 (IL-8) and/or interleukin 10 (IL-10).

23. A compound according to any one of claims 1-22, modified by exchanging carbon, nitrogen and oxygen atoms by other atom(s), preferably oxygen, carbon and hydrogen,

respectively, so as to prevent or decelerate breakdown by proteases and/or peptidases.

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24. An acid salt of any one of the compounds of claims 1-23.

25. A DNA molecule encoding a compound according to any one of claims 1, 2, 4, 5, 9 or 10.

26. A vector comprising a DNA sequence encoding a compound according to any one of claims 1, 2, 4, 5, 9 or 10.

27. A fusion protein comprising one or several copies of the sequence of a compound according to any one of claims 1, 2, 4, 5, 9 or 10.

28. A vector comprising a DNA molecule encoding the fusion protein of claim 27.

sub A5

29. A pro-drug which upon administration to an animal or human is converted to or leads to the formation of a compound according to any of claims 1-24 or to the fusion protein of claim 27.

30. A pharmaceutical composition comprising a compound according to any one of claims 1-24, or the DNA of claim 25, or the vector of claim 26 or 28, or the fusion protein of claim 27 or the pro-drug of claim 29, together with a pharmaceutically acceptable carrier.

31. The use of a compound according to any one of claims 1-24, or the pro-drug of claim 29, or the pharmaceutical of claim 30, for inhibition of the formation of NO (nitric oxide), and/or for the inhibition of the formation of nitrite.

32. The use of a compound according to any one of claims 1-24, or the pro-drug of claim 29, or the pharmaceutical of claim 30, for immunomodulation.

33. The use of a compound according to any one of claims 1-24, or the pro-drug of claim 29, or the pharmaceutical of claim 30, for amelioration, prevention and/or inhibition of contact hypersensitivity.

34. The use of a compound according to any of claims 1-24, or the pro-drug of claim 29, or the pharmaceutical of claim 30, for inhibition and/or prevention of the sensitization by a hapten, the preferred hapten being 2,4-dinitrofluorobenzene (DNFB).

35. The use of a compound according to any one of claims 1-24, or the pro-drug of claim 29, or the pharmaceutical of claim 30, for affecting the induction of hapten tolerance, the preferred hapten being 2,4-dinitrofluorobenzene (DNFB).

36. The use of a compound according to any one of claims 1-24, or the pro-drug of claim 29, or the pharmaceutical of claim 30, for amelioration, prevention and/or inhibition of formation of oedema, in particular oedema associated with allergic reactions or inflammation.

37. The use of compound according to any one of claims 1-24, or the pro-drug of claim 29, or the pharmaceutical of claim 30, for amelioration, prevention and/or inhibition of inflammation of blood vessels or vasculitis.

38. The use of a compound according to any one of claims 1-24, or the pro-drug of claim 29, or the pharmaceutical of claim 30, for normalization of white blood cell counts, said blood cell counts prior to administration of the compound deviating from the normal.

39. The use of a compound according to any one of claims 1-24, or the pro-drug of claim 29, or the pharmaceutical of claim 30, for stimulation of cAMP.

40. A method for treating a disease comprising inflammation or an inflammatory like condition comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

41. A method for treating a disease or condition caused by or associated with one or more of the following: allergy, hypersensitivity, bacterial infection, viral infection, inflammation caused by toxic agent, fever, autoimmune disease, radiation damage by any source including UV-radiation, X-ray radiation, γ-radiation, α- or β-particles, sun burns, elevated temperature, mechanical injury and hypoxia, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

Sub A5 Cont

42. A method for treating an inflammatory disease of the skin (including the dermis and epidermis) of any origin, such as skin diseases having a inflammatory component, in particular contact dermatitis of the skin, sunburns of the skin, burns of any cause, inflammation of the skin caused by chemical agent, psoriasis, vasculitis, pyoderma gangrenosum, discoid lupus erythematosus, eczema, pustulosis palmo-plantaris, and phemphigus vulgaris, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

43. A method for treating an inflammatory disease in the abdomen, including an abdominal disease having an inflammatory component, such as gastritis, including one of unknown origin, gastritis perniciosa (atrophic gastritis), ulcerous colitis (colitis ulcerosa), morbus Crohn, systemic sclerosis, ulcus duodeni, celiac disease, oesophagitis and ulcus ventriculi, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

44. A method for treating a disease or condition that requires immunomodulatory treatment or a disease or condition which is a systemic or general and/or local immunological disease or condition, such as one of an autoimmune nature, and other inflammatory disease of a general nature, in particular rheumatoid arthritis, psoriatic arthritis, systemic sclerosis, polymyalgia rheumatica, Wegener's granulomatosis, sarcoidosis, eosinophilic fasceitis, reactive arthritis, Bechterew's disease, systemic lupus erythematosus, arteritis temporalis, Behcet's disease, morbus Burger, Good Pastures' syndrome, eosinophilic granuloma, fibromyalgia, myositis, and mixed connective tissue disease, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

45. A method for treating a disease or condition of the peripheral and central nervous system related to inflammation, such as cerebral vasculitis, multiple sclerosis, autoimmune ophtalmitis and polyneuropathia, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

46. A method for treating a disease or condition of the eye and tear glands related to inflammation, such as anterior and posterior uveitis, retinal vasculitis, otpicus neuritis, Wegener's granulomatosis, Sjögren's syndrome, episcleritis, scleritis, sarcoidosis affecting the eye and polychondritis affecting the eye, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

47. A method for treating a disease or condition of the ear related to inflammation, such as polychondritis affecting the ear and external otitis, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

48. A method for treating a disease or condition of the nose related to inflammation, such as sarcoidosis, polychondritis and mid-line granuloma of the nose, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

49. A method for treating a disease or condition related to inflammation of the mouth, pharynx and salivary gland, such as Wegener's granulomatosis, mid-line granuloma, Sjögren's syndrome and polychondritis in these areas, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

50. A method for treating a disease or condition related to inflammation in the lung, such as idiopathic alveolitis, primary pulmonary hypertension, bronchitis, chronic bronchitis, sarcoidosis, alveolitis in inflammatory systemic disease, pulmonary hypertension in inflammatory systemic disease, Wegener's granulomatosis and Good Pastures' syndrome, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

51. A method for treating a disease or condition related to the inflammation of the heart, such as pericarditis, idiopathic pericarditis, myocarditis, Takayasus' arteritis, Kawasaki's disease, coronary artery vasculitis, pericarditis in inflammatory systemic disease, myocarditis in inflammatory systemic disease, endocarditis and endocarditis in inflammatory systemic disease, the method comprising the administration of a

pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

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52. A method for treating a disease or condition related to inflammation of the liver, such as hepatitis, chronic active hepatitis, biliary cirrhosis, hepatic damage by toxic agent, interferon induced hepatitis, hepatitis induced by viral infection, liver damage induced by anoxia and liver damage caused by mechanical trauma, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

53. A method for treating a disease or condition related to inflammation of the endocrine or exocrine pancreas, such as of diabetes mellitus including its prevention and late complications, acute pancreatitis and chronic pancreatitis, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

54. A method for treating a disease or condition related to the inflammation of the thyroidea, such as thyreoiditis, autoimmune thyreoiditis, Hashimoto's thyreoiditis, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

55. A method for treating a disease or condition related to inflammation of the kidney, such as glomerulonephritis, glomerulonephritis in systemic lupus erythematosus, periarteritis nodosa, Wegener's granulomatosis, Good-Pastures' syndrome, HLAb27 associated diseases, IgA nephritis (IgA = Immunoglobuline A), pyelonephritis, chronic pyelonephritis and interstitial nephritis, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

56. A method for treating a disease or condition related to the inflammation of the joints such as Bechterew's disease, psoriatic arthritis, rheumatoid arthritis, arthritis in colitis ulcerosa, arthritis in morbus Crohn, affection of joints in systemic lupus erythematosus, systemic sclerosis, mixed connective tissue disease, reactive arthritis, Reiter's syndrome, arthrosis of any joint, in particular arthrosis of finger joints, the knee and the hip, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

SUB A5 Cont.

57. A method for treating a disease or condition related to the inflammation of blood vessels, such as arteritis temporalis, periarteritis nodosa, arteriosclerosis, Takayasus' arteritis and Kawasaki's disease, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

58. A method for affording protection against and prevention of arteriosclerosis, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

59. A method for treatment of drug induced disorders of the blood and lymphoid system, such as drug induced hypersensitivity (including drug hypersensitivity) affecting blood cells and blood cell forming organs (e.g. bone marrow and lymphoid tissue), in particular anaemia, granulocytopenia, trombocytopenia, leukopenia, aplastic anaemia, autoimmune haemolytic anaemia, autoimmune thrombocytopenia, autoimmune granulocytopenia, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

60. A method for treating a disease or condition related to fast allergic disorders (Type I allergy) such as anaphylactic reactions, anaphylactoid reactions, asthma, asthma of allergic type, asthma of unknown origin, rhinitis, hay fever and pollen allergy, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

61. A method for treating a disease or condition related to infections of any origin, preferably treatment of inflammation secondary to infection caused by virus, bacteria, helminths and protozoae, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

62. A method for treating a disease or condition related to trauma and tissue injury of any origin, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

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63. A method for stimulating pigment formation in epidermal cells, such as skin tanning for cosmetic reasons, for treatment of vitiligo, or any other condition where darkening of skin color is desired, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.

64. A method for inhibiting pigment formation in cells of the skin, the method comprising the administration of a pharmacologically effective amount of a compound according to any one of claims 1-24 to a patient or a healthy individual.